Agility in Construction

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Abstract—Agile Project Management (APM) is a human-centred method for increasing customer-perceived value in a reliable manner. It has been proven to be particularly suited to creative projects such as Information Systems (IS) development and new *product development* in the automotive industry (this is in contrast to 'lean production' which has proved so useful to automotive *production* waste elimination). Construction is similarly largely a creative industry and might usefully adopt APM to improve its own reliable value delivery, rather than solely following the industrial trend of lean production. This paper describes APM, comparing it with two prominent lean construction initiatives, and then assesses by phase the potential for any impact of APM in construction. In conclusion: APM would have benefits for all phases of construction, particularly in planning and design, but its adoption for actual construction would generally be disrupted because of the lack of a coherent, well trained and trusted workforce.

Index Terms—Agile, Project Management, Construction.

1 Introduction

Formal records of production management techniques can be traced back to Mencius (372-289BCe) and theoretical considerations to the Greek philosophers around the same period. Developments in terms of complexity during the industrial revolution forced the introduction of a general management skill and the refinement of task and object decomposition. During these developments and through to the present, western management and work practices have concentrated on this decomposition and moved away from the process thoughts of old (for a full treatment of metaphysical approaches to production, see [1]). Agile Project Management (APM), particularly as recently evolved within the Information Systems (IS) industry, provides new opportunities for work and management organisation based on the re-thinking of how value can be optimised through acceptance of change as an unavoidable ingredient of the project process.

This paper explores the potential impacts of applying APM for construction by analysing the core attributes of agile methodologies. The attributes are then compared to the needs of the construction industry to assess their most appropriate utilisation.

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2 Current Status of APM

The development history of APM has been described in a previous paper [2]. Two methods are being particularly actively employed to improve the reliable delivery of value by IS projects; these are Scrum and DSDM. Scrum can be used as a generic emergent process management method and is considered light weight in terms of overhead. Scrum was derived from the practices of automotive product development in Japan and is described fully elsewhere [3].

DSDM has a different heritage and grew from early attempts at IS APM; it is a more holistic method for PM. DSDM has, in common with Scrum, moved beyond its original domain and has been used on a wide variety of projects on an ad hoc basis, including in construction [4].

Both Scrum and DSDM typify the focus of APM methods on reliable value delivery, rather than the fixing of comprehensive requirements fixing at the early stage of project planning:

> *In DSDM time is fixed for the life of a project, and resources are fixed as far as possible, but the requirements that will be satisfied are allowed to change* [5].

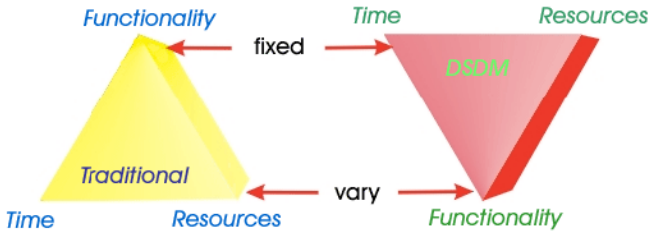

Figure 1. DSDM Requirements Treatment [5]

3 Differentiation of Agile From Traditional PM

The underlying philosophy, characteristics and attributes of different project management methods have been reviewed in a number of workshops and fora; the most important differentiators are set out below.

3.1 Philosophical Grounding

Koskela [6] has argued that western management methods are grounded in 'thing metaphysics' and has postulated that this may have a causal link from the language structures of most of western Europe. On the other hand, APM is grounded in process metaphysics; APM at least partially originates from Japanese automotive product development practices and is naturally suited to iterative and incremental development based on emergent requirements.

3.2 Attitude to Change

Laufer [7] differentiates the 'old mind-set' with the 'simultaneous management mind-set' in terms of coping with unavoidable change. However, APM takes this further to

positively embrace change as an opportunity to improve delivered value. A natural consequence of such pragmatic action is that planning can (and should) be reduced significantly in order to avoid nugatory effort [8]. As a direct consequence, it becomes essential to involve the customer with the development team throughout the project in order that they can both help to prioritise value delivery and also change these in the light of emergent knowledge.

3.3 Optimisation of Human Interactions & Outputs

APM teams are typically small and fit well with the overall theory of human teams [9], [10] (also echoing insect societies and thus suggesting a common underlying bio-mathematical cause). In several APM methods the teams are self organising, and are facilitated and enabled by their process manager, rather than managed via an autocracy. Significant performance advantages are summarised in an earlier paper [8] and would seem to be linked to the combinative interaction of individual intelligence yielding greater output than that achieved by similar numbers of people working in parallel, loosely connected endeavours (insects offer the obvious model in terms of swarm intelligence [11]).

The APM practice of frequent value delivery and consequent reliable feedback also may help drive the motivational engine of the team, although this area of human dynamics has yet to be resolved in terms of underlying causality.

Figure 2 combines the various imperatives of APM. The aims of APM are to:

- Commence value delivery as soon as possible, minimising the length of the value identification phase
- Iterate and increment the development and delivery of value
- Continue the identification and delivery of to realise value for as long as possible

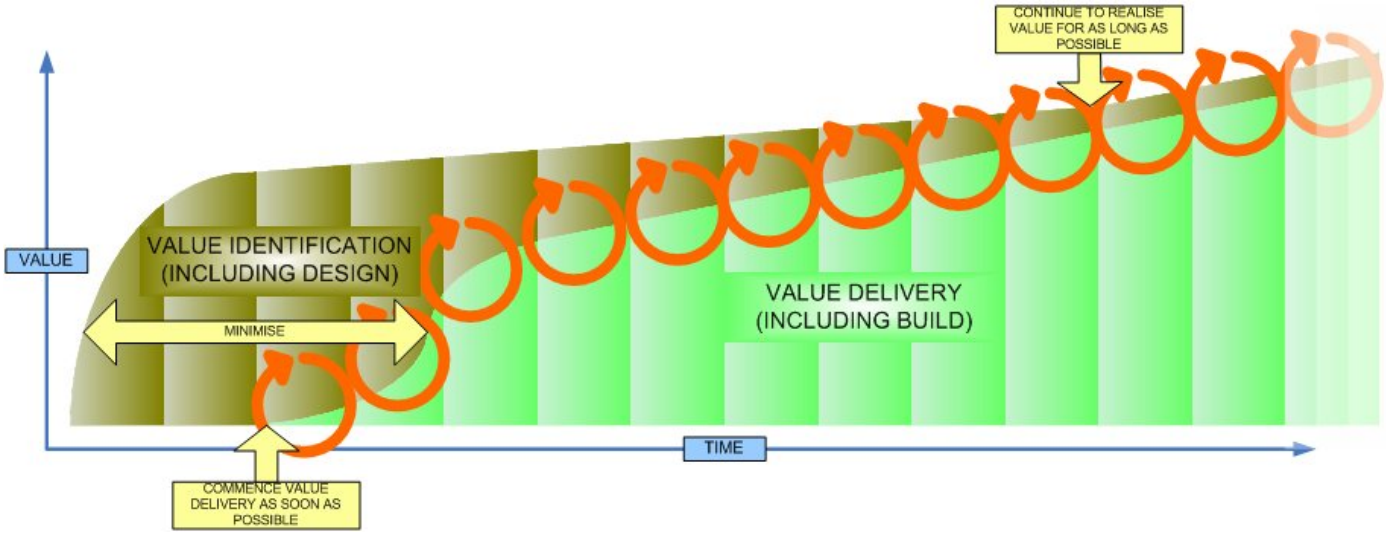

Figure 2: The Aims of APM

3.4 Organisational Attitudes & Practices

Partnering and new methods of contracting are starting to be employed on an ad hoc basis; these are essential in order to allow the degree of openness and trust necessary when the supplier and customer are effectively working as a team. It is also essential that any risk is addressed openly in order for value to be reliably delivered, and that this risk treatment is seen as providing value by the customer.

4 Construction Project Initiatives

Although the construction industry has a far better record of delivering projects than does the IS industry (for example, see [12]), it nevertheless sees itself as inefficient and comparatively unprofitable. In order to overcome these perceived weaknesses, the UK developed its own version of Lean Construction through its Construction Lean Improvement Programme (CLIP). CLIP focuses on waste reduction and performance bench marking and was launched by the Department of Trade and Industry in 2003.

Further afield, the International Group for Lean Construction (IGLC) is at the forefront of the movement to improve construction project management. It is comprised of academics and industrial partners from around the world. The IGLC has developed its own version of lean production and this also incorporates agility to a limited degree, though not in a holistic manner. Of particular note are the recently reported experiments [13] using target costing; this method has parallels with the well established DSDM APM method mentioned above.

These two lean construction movements are compared against APM in Table 1.

Table 1: A Comparison between Lean Construction and APM

	UK Lean Construction	IGLC Lean Construction	APM
Evolved from	Toyota Production Methods/ Egan/ Construction Lean Improvement Programme	Toyota Production Methods/ Koskela TFV Theory/ Theory of Constraints/ Complexity Theory/ Systems Thinking	Honda & Toyota Development/ Iterative & Incremental Methods/ Complexity Theory
Key Tenets	Waste Reduction & Bench Marking	Waste Reduction, Flow & Value	Emergent Value & Rapid Feedback
Signature Methods	Supply Chain Relationship Change/ Just In Time/ Performance Measurement/ Customer Pull	Collaborative Working & Distributed Management (Last Planner)/ Customer Pull	Embedded Customer/ Empowered, Multi-disciplinary Teams
Essential	Repeatability/ reliability	Reliability	Reliability
Continuous Type 2 Learning	Push/ Top Down	Partial (Design & Last Planner) but evolving	Yes
Decisions Delayed Until Last Responsible Moment	No	Partial (Last Planner) but evolving	Yes

5 APM & CONSTRUCTION

As both construction and IS involve creative design, consideration was given as to whether it might be either possible or desirable to apply holistic APM to construction. This was addressed through iterative informal workshops involving academics, construction specialists and an IS specialist. The cumulative subjective interpretation of applicability was divided into the pre-design, design and construction phases; results of this appraisal are set out below. (For further information on the background to this assessment, see [14].)

5.1 Pre-design

Arguably, agile principles and methods promise the potential of an improved approach for the pre-design phase, being simultaneously appropriately structured but also flexible enough to allow opportunities to be seized and creative solutions to be devised.

5.2 Design

The adoption of APM principles in the design phase is very appropriate, dependent on the complexity and uncertainty of the project. It would be particularly appropriate where:

- Solutions to requirements evolve or are likely to change through the project
- A considerable number of clients are involved
- Requirements are conflicting and constantly generate trade-offs
- Early delivery of value is a priority

5.3 Production

There are many more interdependent activities in the construction phase and APM concepts could be a powerful tool for construction managers, particularly for planning in the production phase of construction. However, for managing construction execution, a great amount of effort would be needed, beginning with a culture change within the sector. This need derives from the fragmented nature of the sector and its poor employment practices and commitment to training. (This situation is not universal – Denmark is, for instance, a notable exception).

6 CONCLUSIONS

Most good project managers have abandoned the idea that we take on a project, plan it, fulfil the plan and then throw the resultant (sometimes mis-) interpretation back over the wall to the customer. However, to work in the sort of agile manner described previously (and reap the gains described in previously referenced papers) we also need to build trust between suppliers and their customers. We need to be in control of project risks; passing these off to lower level sub-contractors may appear to work in the short term but it destroys trust and builds the types of adversarial relationships which render commerce inefficient, adding layers of management, lawyers and accountants which soak up potential value to the customer and profit to the supplier.

6.1 Your Own People Are Best

A second inhibitor to agility in many businesses is the lack of a long-term highly trained workforce; this situation is generally particularly acute in the construction sector. If an organisation trains people to learn and to continuously improve that organisation, it stands a far better chance of ending up with the sort of organisational success that Toyota has achieved. This type of model is impossible in hollowed out organisations

(typified by many parts of the construction industry, including in the UK); only by developing both best practice and best people will it be possible to holistically adopt APM.

6.2 Long Term Business Growth

Above all, we have to learn that projects may be defined as temporary endeavours but are, in best practice, a part of the continuing process of business' and society's evolution for the better. Adopted as a broad philosophical approach, agile project management results in enhanced delivered value for the customer, thus building the foundations for longer term, mutually beneficial business relationships and that all-important trust network.

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